Original Research

Evaluating the knowledge of pain management and the impact of PASHA (Pain Assessment Stimulation and Healing Application) on pain intensity among Indonesian adolescents

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Abstract

Background: Effective pain management for adolescents is essential because it significantly affects their quality of life and can prevent the development of chronic pain. Although there have been advancements in this field, managing pain effectively remains challenging, highlighting the need for innovative approaches that combine technology with clinical practice.

Objective: This study aimed to assess adolescents' pain management knowledge and evaluate the effectiveness of the PASHA (Pain Assessment Stimulation and Healing Application) in reducing pain intensity among adolescents.

Methods: A combination of a cross-sectional design ($N = 461$) and one group pretest-posttest approach ($N = 60$) were employed in a Junior High School at Bukittinggi, West Sumatera, Indonesia. Data were collected from June to August 2022 using the Nursing Outcomes Classification (NOC) to assess pain management knowledge and the Numeric Rating Scale (NRS) to measure pain intensity. The intervention involved using the PASHA application for three days,

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with pain intensity assessed before and after. Descriptive statistics and Paired *t*-test were used for data analysis.

Results: Headaches were the most prevalent pain type among adolescents (60.5%). Many adolescents lacked adequate knowledge about pain management (57.7%) and self-medication practices (49.2%). Massage/acupressure therapy was the most recognized pain management strategy (39.1%), while aromatherapy was the least known (4.8%). The PASHA application significantly reduced pain intensity (Mean difference = 0.567, p <0.001).

Conclusion: Adolescents had moderate knowledge gaps in pain management, particularly in chronic pain and non-pharmacological strategies. The PASHA application effectively reduced pain intensity, suggesting its potential to enhance pain management outcomes. Future research is necessary to validate the findings.

Keywords

Background

Pain is a widespread symptom associated with various diseases and is particularly prevalent among adolescents and hospitalized children (Krauss et al., 2016). Effective management of pain in this demographic is crucial because untreated acute pain can potentially develop into chronic pain (Rabbitts et al., 2017), significantly impacting their quality of life and affecting both social and emotional well-being for both adolescents and their families (Walker, 2008).

Understanding pain in adolescents involves recognizing its multifaceted nature, including sensory, physiological, cognitive, emotional, and behavioral components. Research has increasingly focused on understanding how children and adolescents experience and express pain, whether in hospital settings or at home (Pope et al., 2015). Despite advancements in pain management, many hospitalized adolescents still experience moderate to severe pain due to inadequate analgesic treatment, highlighting the urgent need for improved approaches (Birnie et al., 2014).

Chronic pain in school-aged children presents a significant challenge for caregivers, necessitating a multidisciplinary approach and specialized pediatric pain rehabilitation programs (Landry et al., 2015). Psychological aspects of pain management are also crucial, prompting the exploration of complementary and alternative interventions alongside conventional treatments (Oduro et al., 2020).

Non-pharmacological techniques, such as relaxation and distraction therapy, are increasingly utilized to reduce pain in adolescents, especially in cases of acute and postoperative pain (Kahsay, 2017). The effectiveness of multimodal analgesic approaches, which combine different medications to target various pain mechanisms, is emphasized over single-modality treatments (Chou et al., 2016). In addition, personalized pain management strategies are essential, considering each patient's unique pain perception and responsiveness to different therapies (Friedrichsdorf & Goubert, 2020). However, gaps remain in understanding and effectively managing pain in children and adolescents, particularly in healthcare settings (Vejzovic et al., 2020).

Advances in technology, such as mobile health interventions like the Pain Buddy app, illustrate the evolving landscape of pain management tools for children, offering accessible support for managing symptoms remotely (Fortier et al., 2016). Information technology is pivotal in healthcare innovations, including real-time pain assessment and management systems that use mobile devices to enhance patient care (Knab et al., 2001). Moreover, the PASHA (Pain Assessment Stimulation and Healing Application) represents a significant development in digital pain management tools, utilizing technologies like PHP and MySQL to provide real-time support for chronic pain management (Nugraha et al., 2022). Its adoption highlights the growing demand for accessible and effective solutions to alleviate pain and improve health outcomes among adolescents. Overall, integrating technology and comprehensive care approaches is crucial for advancing pain management strategies tailored to the needs of children and adolescents, enhancing both treatment efficacy and patient experience.

Given this phenomenon, our study has two main aims. The primary aim was to observe pain management knowledge among adolescents. The secondary aim was to evaluate the effectiveness of the web-based PASHA application in pain intensity among adolescents. These objectives aim to contribute to ongoing efforts to improve adolescent pain management strategies, integrating technological advancements with clinical practice.

Methods

Study Design

To address the two objectives, a combination of two designs was used: 1) a cross-sectional design was employed to observe pain management practices, self-management experiences, knowledge related to pain management, and adherence to pain treatment standards in adolescents by examining how they manage their own pain; and 2) a quasi-experimental design with a one-group

pretest-posttest approach was used to determine the effect of using the PASHA web-based application on pain intensity.

Samples/Participants

This study was conducted with a sample of 461 adolescents aged 12-15 was recruited from a school-based population using randomized sampling. Power analysis tables were used to calculate the sample size, with an alpha level of 0.05 and a medium effect size of 0.25 (Polit & Beck, 2010). This provided a statistical power of 0.95, resulting in the inclusion of 461 adolescents to address the first objective. For the second objective, which was to determine the effect of using the PASHA application on managing pain, 60 adolescents experiencing moderate to severe pain were selected based on inclusion criteria.

Instruments

The instrument to measure knowledge of pain management was a modified questionnaire based on the Nursing Outcomes Classification (Moorhead et al., 2013), previously validated for validity and reliability. Validity was confirmed with results ranging from 0.367 to 0.792 and a correlation coefficient (r) of 0.897. In this study, the Cronbach's alpha ranged from 0.883 to 0.897, indicating high reliability. Responses for each statement on the questionnaire ranged from "1" (Didn't know), "2" (Know enough), "3" (Know), to "4" (Really know). The questionnaire comprised 15 items to gather information about adolescents' pain management knowledge, including knowledge of pain management experience, medication, and strategies.

To assess the effectiveness of the PASHA application on pain intensity, respondents were evaluated using the Numeric Rating Scale (NRS), a widely validated tool for assessing pain intensity, which ranges from 0 to 10, with 0 indicating no pain and 10 representing the worst pain imaginable (Nugent et al., 2021). The NRS was employed to gather numeric data measuring pain intensity before and after using the PASHA application.

Intervention

For the second objective of the study, the intervention involved using the PASHA application for three days to manage pain. This application includes pain assessment using the PQRST method (Provoke, Quality, Region, Scale, and Time) and providing stimulation and healing through pain management techniques. After this period, the adolescent's pain levels were reassessed. Details of the intervention are outlined in Figure 1.
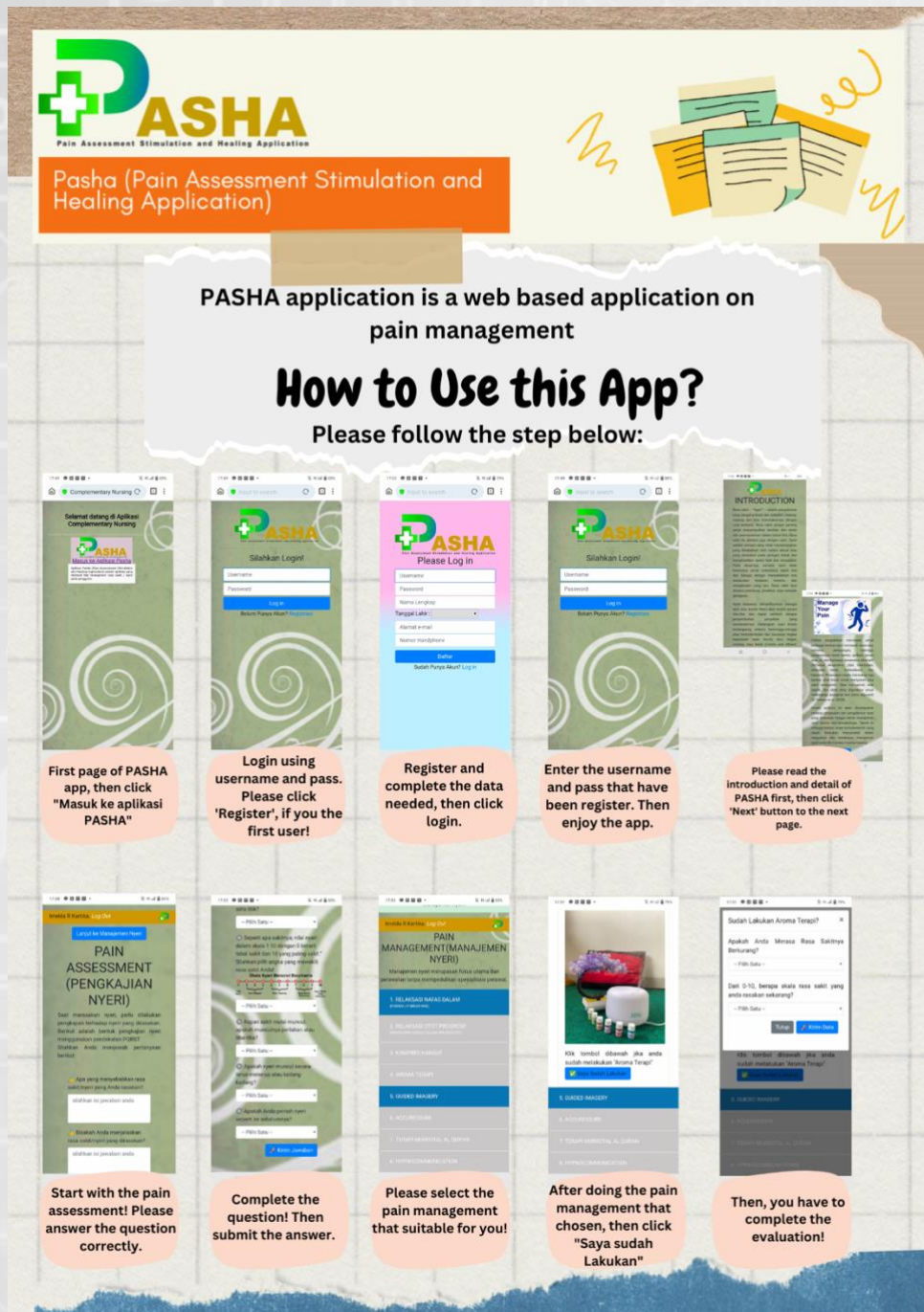
Figure 1 How to use the PASHA application

Data Collection

Data were collected by the researchers in a Junior High School at Bukittinggi, West Sumatera, Indonesia, from June to August 2022. There was no research assistant to collect the data.

Data Analysis

All of the respondents' data collected from the questionnaires were subsequently analyzed. They were entered and processed using SPSS (Statistical Package for

the Social Sciences) version 16.0, followed by descriptive statistics to measure the characteristics of the respondents and their knowledge of pain management. A dependent t-test was employed to assess the PASHA application's effect on adolescents' pain intensity. A significant level was set at 0.05.

Ethical Considerations

This study was conducted following approval from the Ethics Committee of Fort De Kock University under approval number 518/KEPK/X/2022. The research adhered to official protocols, and all respondents provided informed consent before participating in the study.

Results

Table 1 highlights the characteristics and knowledge of pain management among 461 adolescents. The majority of respondents were female (57.3%), with headaches being the most commonly reported type of pain (60.5%). Knowledge about pain experiences showed that 57.7% lacked good knowledge, and self-medication knowledge was nearly evenly split, with 49.2% not having good knowledge. Among pain management strategies, massage therapy was the most well-known (39.1%), while aromatherapy was the least recognized (4.8%).

Table 1 Characteristics of respondents and categories of adolescent knowledge of pain management (N = 461)

Variable	f	%
Age	Mean = 13.8 (SD = 0.673)	
Gender		
Male	197	42.7
Female	264	57.3
Type of Pain		
Abdominal pain	71	15.4
Low back pain	36	7.8
Menstrual pain	75	16.3
Headaches	279	60.5
Knowledge of Pain Experience		
Good	195	42.3
Not good	266	57.7
Knowledge of Self-medication in Pain Management		
Good	234	50.8
Not good	227	49.2
Knowledge of Pain Management Strategies		
Aromatherapy	22	4.8
Compress therapy	124	26.9
Musical therapy	76	16.5
Massage therapy	180	39.1
Relaxation therapy	59	12.7

Table 2 shows the description of the items of pain management knowledge among 461 adolescents, presenting mean scores, standard deviations, and ranges for each category. Knowledge about pain management experience had an overall mean score of 7.63 (SD = 3.198), with individual items ranging from 1.47 to 2.15. For self-medication on pain management, the mean score was 10.98 (SD = 4.448), with items such as knowing about the storage of drugs properly scoring 2.52. Knowledge about pain management strategies had a mean score of 11.52 (SD = 4.879), with massage therapy being the most recognized strategy. The overall pain management knowledge had a mean score of 10.1 (SD = 4.175), indicating moderate knowledge across all categories.

Table 2 Description of the items in pain management knowledge (*N* = 461)

Items	Mean (SD)	Range
Knowledge about Pain Management Experience	**7.63 (3.198)**	**4-16**
I know about provoking pain	1.99 (1.119)	1-4
I know about the symptoms of pain	2.15 (1.136)	1-4
I know about pain management strategies	2.01 (1.157)	1-4
I know about chronic pain management	1.47 (0.848)	1-4
Knowledge of Self-medication in Pain Management	**10.98 (4.448)**	**5-20**
I know how to use safe medication prescribed	2.39 (1.198)	1-4
I know about medication side effects	2.00 (1.055)	1-4
I know about the storage of drugs properly	2.52 (1.181)	1-4
I know about the importance of adherence to a drug regimen	2.03 (1.143)	1-4
I know about the importance of informing healthcare professionals about current medications	2.03 (1.122)	1-4
Knowledge about Pain Management Strategies	**11.52 (4.879)**	**6-24**
I know about non-pharmacological pain management techniques	1.82 (1.072)	1-4
I know about deep breathing relaxation technique	1.81 (1.097)	1-4
I know about the benefits of relaxation techniques	1.87 (1.092)	1-4
I know about other pain management	1.50 (0.841)	1-4
I know about massage therapy (acupressure) in pain management	2.15 (1.138)	1-4
I know about the benefits of massage therapy (acupressure)	2.37 (1.223)	1-4
Overall Pain Management Knowledge	**10.1 (4.175)**	**4-24**

Table 3 illustrates the effect of PASHA on the pain intensity of 60 adolescents, using a paired *t*-test to compare pain levels before and after the intervention. The mean pain intensity before using PASHA was 3.567 (SD = 2.239), which decreased to 3.000 (SD = 2.034) after the intervention. The mean difference in pain intensity was 0.567 (*p* = 0.0001), indicating a statistically significant reduction in pain intensity at the α = 0.05 level.

Table 3 Effect of using PASHA application on pain intensity of adolescents (*N* = 60)

Variable	Variable	Mean	SD	Mean Difference	*p*-value
Pain Intensity	Before	3.567	2.239	0.567	0.0001
	After	3.000	2.034		

Discussion

Summary of the Findings

Our study investigated pain management characteristics and knowledge among adolescents, focusing on their understanding, self-medication practices, awareness of pain management strategies, and the impact of the PASHA application on pain intensity. Among 461 adolescents, headaches were the most frequently reported type of pain, followed by menstrual and abdominal pain. These findings indicate the significance of headaches among adolescents, likely influenced by factors such as stress, screen time, and inadequate sleep (Blaschek et al., 2012; Pope et al., 2015), as well as physical, psychological, and social factors (Kamper et al., 2016).

A majority (57.7%) of respondents demonstrated inadequate knowledge about pain, highlighting a need for improved education and awareness programs targeting adolescents. Similarly, nearly half (49.2%) lacked sufficient knowledge about self-medication, raising concerns about potential medication misuse and emphasizing the importance of educating adolescents on safe medication practices.

Massage/acupressure therapy emerged as the most recognized pain management strategy among adolescents, whereas aromatherapy was the least familiar. This suggests a gap in awareness regarding non-pharmacological pain management techniques, indicating a potential area for healthcare professionals to focus on educational interventions. Non-pharmacological approaches such as sleep regulation, dietary adjustments, stress management, exercise, and identifying pain triggers are crucial in managing adolescent pain (Khalili et al., 2023).

Detailed analysis of specific questions on pain management knowledge revealed moderate overall scores. While respondents showed a better understanding of pain triggers and symptoms, knowledge about managing chronic pain was comparatively lower, indicating areas where educational efforts could be enhanced. Regarding self-medication practices, adolescents scored moderately (mean score 10.98), with better awareness of drug storage but limited knowledge about side effects and adherence to drug regimens. This underlines the necessity for targeted education in these aspects. Knowledge about pain management strategies averaged a score of 11.52, with massage/acupressure therapy being well-recognized but less understanding of techniques like deep breathing and relaxation, highlighting a gap in holistic pain management approaches.

The study found moderate pain management knowledge among adolescents (mean score 10.1), suggesting room for improvement, particularly in chronic pain management and non-pharmacological strategies.

Furthermore, our intervention using the PASHA application with 60 adolescents demonstrated a statistically significant reduction in pain intensity. Pain intensity decreased from 3.567 (SD = 2.239) before using the app to 3.000 (SD = 2.034) post-intervention, with a mean difference of 0.567 ($p < 0.0001$). These results indicate that the PASHA application could effectively aid adolescents in managing pain by providing valuable resources and strategies, potentially reducing overall pain intensity. This aligns with prior research (Nugraha et al., 2022), supporting the positive impact of PASHA on pain management. Smartphone applications that integrate physical and psychological pain management tools could be particularly beneficial for adolescents dealing with chronic pain, mitigating its adverse effects on their lives (Shaygan & Jaberi, 2021).

Strengths

This study's strengths lie in its focused evaluation of the impact of the PASHA application on adolescent pain management using quantitative methods. The study provides concrete evidence of the application's effectiveness by employing standardized pain intensity scales and demonstrating statistically significant pain reduction post-intervention. Real-time pain assessments through the application enhance the immediacy of feedback, potentially improving the responsiveness of pain management strategies. Moreover, the study's findings are relevant in increasing digital health solutions, highlighting practical implications for integrating smartphone applications into clinical settings to enhance patient care. The patient-centered approach to addressing adolescent pain needs further highlights the study's relevance in improving healthcare delivery and patient outcomes in this demographic.

Limitations

This study's primary limitations sre from its one-group pretest-posttest design, which precludes establishing causal relationships between using the PASHA application and changes in pain intensity. The absence of a control group means that alternative explanations for the observed pain reduction cannot be ruled out, such as natural fluctuations in pain levels or other concurrent interventions. Additionally, the small sample size of 60 adolescents may not adequately represent the broader adolescent population, limiting the generalizability of findings. The short-term follow-up period and reliance on self-reported pain data further introduce potential biases, including the placebo effect and variability in

reporting accuracy. Moreover, the study's single-setting approach and lack of differentiation between different types and locations of pain restricts the applicability of results across diverse pain conditions and environments.

Implications

Our study provides critical gaps in adolescent pain management knowledge and the promising role of digital health solutions like the PASHA application in reducing pain intensity. Healthcare policies should prioritize comprehensive education initiatives aimed at improving adolescents' understanding of pain symptoms, safe medication practices, and non-pharmacological pain management techniques. Integrating evidence-based digital health tools into clinical settings should be encouraged, ensuring they are accessible and effective in enhancing patient outcomes. Furthermore, policies should support research that addresses study limitations, such as small sample sizes and short-term follow-ups, to establish robust evidence on the efficacy of interventions. Emphasizing patient-centered care and promoting interdisciplinary approaches to pain management are crucial for tailoring treatments to adolescents' diverse needs and improving long-term pain management strategies across healthcare systems.

Conclusion

The study highlights significant gaps in adolescents' knowledge about pain management, particularly a moderate level of knowledge in chronic pain and non-pharmacological strategies. The effectiveness of the PASHA application in reducing pain intensity highlights the potential of digital interventions in pain management education. Future efforts should focus on enhancing adolescents' pain management education, incorporating pharmacological and non-pharmacological strategies to improve their overall pain management skills and well-being. However, addressing the limitations is needed to confirm the study results, and advancing the study design with control groups is necessary for validating the effectiveness of the application.

Authors' Contributions

Imelda Rahmayunia Kartika was responsible for manuscript writing, document searching, outline creation, draft article composition, methodology, and final article completion. *Fitrianola Rezkiki* subsequently reviewed the article, collected data, reviewed the methodology, and analyzed data. *Hafiz Nugraha* contributed to the development of the application, screening the raw data, data collection, data cleaning, data entry, and data analysis. All authors approved the final version of the article to be published.

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Data Availability Statement

All datasets generated and analyzed during the study process are not made public but available from the corresponding author upon reasonable request.

Declaration of the Use of AI in Scientific Writing

There is nothing to declare.

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